

# TPM Volume-13

## Total Preventive Maintenance

*Oil control -3*

2021a Edition

Koichi Kimura



Factory Management Institute

---

COOPERATING TO REACH EXCELLENCE



ESP: Este trabajo está protegido bajo licencia Atribución-NoComercial-SinDerivadas 4.0 Internacional.

ENG: This work is licenced under the Attribution-NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0). To view a copy of this license, visit <https://creativecommons.org/licenses/by-nc-nd/4.0/deed.es> and <http://creativecommons.org/licenses/by-nc-nd/4.0/> and <https://creativecommons.org/licenses/by/4.0/legalcode>. This work consists of 43 pages. The Factory Management Institute.

Author: Koichi Kimura. **Japan May-2021**. Translation, Adaptation & Edition: Eduardo L García. **The Netherlands May-2020**.



**Sensei Koichi Kimura:** International Consultant of the TPS (Total Productive System), TQM, TPM (Total Productive and Total Preventive Maintenance), Kaizen and Factory Management. Expert in the introduction and fixing of these ones through personal growth and assistance to the management for the change organization.

**Sensei** Koichi Kimura worked in Production **Gemba** for more than 45 years during which he developed the JIT production system as supplier for Toyota, Honda, etc. in SUMITOMO Corp. from the position as young engineer, to General Manager passing throughout internal & external consulting.

At time of publication and over the age of 75, he continues working on the dissemination of original Japanese methods and more knowledge even the one learned from the pioneers and, continues working as international consultant for the last 23 years in more than 11 countries, training clients, as a lecturer and writer. Even now, experimenting and researching innovative methods and growing in the field of Production Management and Corporate structuration.



Factory Management Institute



Título de la Versión Española:  
**Factory Management - TPM Mantenimiento Preventivo Total. Volumen 13 -2021a**  
**El control de la lubricación - 3**

Title of English Version:  
**Factory Management - TPM Total Preventive Maintenance. Volume 13 -2021a**  
**Oil Control - 3**

Autor/Author:  
 Sensei Koichi Kimura – JAPÓN/JAPAN © 2021  
<https://jp.linkedin.com/in/kouichi-kimura-2ba37152/en>



Traducción, Edición y Adaptación de la versión española:  
Edition and Adaptation of the English version:  
 Sensei Eduardo L. García – The Netherlands © 2021



<https://es.linkedin.com/in/edulgg>

El Documento ha sido editado para su impresión en Doble Cara sobre DIN-A4 +  
 Encuadernación

*This Document has been edited to Double-Side Printing over DIN-A4 + Bookbinding*

**“Factory Management Institute”** es una organización en período de constitución a la fecha de la  
 publicación de este trabajo: 25 de Mayo de 2021. [www.factorymanagementinstitute.com](http://www.factorymanagementinstitute.com)

**“Factory Management Institute”** is an Organization in the Period of Incorporation at the date of  
 publication of this work: May, 25<sup>nd</sup> 2021. [www.factorymanagementinstitute.com](http://www.factorymanagementinstitute.com)

Nota Legal: Las marcas registradas mencionadas en este texto son propiedad de sus respectivos  
 dueños.

**Legal Notice:** Trademarks mentioned in this text are the property of their respective owners.



Haga clic en la imagen, o escanee el código QR, para ver todas las lecturas del Factory Management  
 Institute de Koichi Kimura, cargada permanentemente accesible y para siempre en Internet-Archive.org  
*Click on Image or Scan QR-code to see all Factory Management Institute Lectures by Koichi Kimura,  
 permanently accessible & forever uploaded into Internet-Archive.org*

## Content

<b>I.</b>	<b>Introduction .....</b>	<b>7</b>
	Machine Breakdown. ....	7
<b>II.</b>	<b>Cost Reduction .....</b>	<b>9</b>
1.	Incorrect cost reduction. ....	9
2.	What is “Cost” .....	9
3.	P/L Calculation.....	9
4.	Profit Plan and the management. ....	10
<b>III.</b>	<b>Incorrect Cost Reduction.....</b>	<b>11</b>
	Just labour reduction in efficiency improvement, and Just indirect (support) labour reduction with AI & IoT.....	12
	Fixed cost reduction in machines and facilities. ....	12
	Material purchase price forced reduction; Outsourcing price forced reduction. ....	12
	Wrong usage of outsourcing .....	14
<b>IV.</b>	<b>Oil Control III .....</b>	<b>19</b>
	An episode-1 (Mr. Suzumura). ....	19
	An episode-2 (a manufacturing company). ....	21
	5S + Visual Control.....	29
	Unification of lubricating oil .....	32
	QC-Circle deployment .....	32
	The training items they picked up and standardized were:.....	38
	Transferring responsibility to operator. ....	39
	The task of operator.....	40
	MACHINE CORPSE .....	41
	MACHINE GRAVEYARD .....	42
<b>V.</b>	<b>Next Lecture .....</b>	<b>43</b>

## Icons:



Notes: Going and Comeback to the main theme.



Third level of the Issue, in order to provide more clearness to the structure of the text.



Lower levels of the Issue, commonly 6<sup>th</sup> or 7<sup>th</sup> And, pointing out necessary explanations about pictures or graphs.

## UPDATING TABLE:

Date, Version-Previous & V-Next	Chapter (I..XX...)	Chapter Point.- sub-point : (Updating)

This page is intentionally black

# I. Introduction

Once again, I make a question...Why a company wishes to introduce TPM does?

When I get the requirement of TPM introduction, I tell one permission and one question.

One permission is that My teaching is not Total Productive or Production Maintenance or Management, but Total Preventive Maintenance which is to implement **Machine Preventive Maintenance by Total** which is the meaning of “**All People’s Participation from Production Gemba to Top Management**”.

And, most of the clients show the confusion, eventhough they mention their desire which is to improve the machine performance. But I continue to make questions why you wish to improve machine performance do.

They respond that they wish it for Cost Reduction related to the machine process.

Cost Reduction in machine process? ...This is the second question.

Their claim is that many **Mudas** are in the machine process. It is quite true, because the machine production process is main process of their company. And, many **Mudas** occurs in the main process. Also, they say that many **Mudas** such as defect and machine breakdown.

But according to the preliminary investigation, all most of the defects of the company in the Pareto Diagram is not related to the machine, but human error such setup mistake, material misuse, and not to relate to machine original performance. And, the thing that exacerbates the situation is the big production lot size. And, it is not the TPM issue, but TQM, Production Control, Inventory Control and SMED<sup>1</sup> (Single Minute Exchange Die).

## Machine Breakdown.

One of their claims is the **Mudas** of Machine Breakdown.

They say that: “sometimes it is not possible to produce necessary production in necessary timing, because of unexpected machine troubles”. Thus, I’m a little spiteful when confirming a client’s true requirement.

Are there relations between *Unexpected Machine Troubles* and *Necessary Production in Necessary Timing*? ...In this company, it seems to be there is no relation. Because there are so many obsolescence and excess products.

Their desire of machine performance improvement in TPM activity with the concept of “Exert necessary performance and capacity at necessary timing” is correct. But the major problem for Necessary products at Necessary timing is not the issue of machine process, but the production planning system and the inventory control.

---

<sup>1</sup> SMED + Design-Thinking perspective: <https://archive.org/details/design-thinking-practical-introduction> & <https://archive.org/details/design-thinking-introduccion-practica-elg-2020>

If their wish is the Cost Reduction, the requirement of TPM introduction is besides the point, even though TPM is Total Productive or Production Maintenance or Management which target to improve factory with through the point of view of machinery. However, It is good thing to implement TPM as a method of Cost Reduction and as a companywide activity.

And for the implementation of a companywide activity, I recommend you to consider the diversity which is *“Diversity of organization, diversity of people and diversity of thinking”*.

**Koichi Kimura**  
**International Consultant**  
*Factory Management Institute*



## II. Cost Reduction

Before going to the main theme, I would respond to a question about Cost Reduction.

It is indeed many (yes, many) questions regarding cost reduction. And many (yes, many) companies misunderstand the way of "cost reduction". There are difficulties to respond to individual cases, because individual companies have their own situation.

Therefore, in here I write just general theory for your reference.

Actually, I have hesitated to write this theme, because of the volume required to write. But I write this in several times made into a series.

The target agendas are:

1. Incorrect cost reduction
2. What is cost
3. P/L Calculation
4. Profit Plan and the management.

### 1. Incorrect cost reduction.

This is the motivation to write. I have seen many companies and the cases of cost reduction mistaken (including my own bad experience).

It is intended to reduce cost. But actually, it isn't affected to sufficient cost reduction or against it becomes as a cause of additional cost up or moreover becomes as a cause of damaging future vitality.

It is quite true that everybody wishes to reduce cost for the purpose of "profit increase". But their actual activities are against in many cases. And, as the introduction of these series, I describe this one firstly.

### 2. What is "Cost"

Please remember that so called "Cost" has many faces. And, depending upon the base calculation, the meanings are very much different.

In this chapter, let's look the natural shapes.

### 3. P/L Calculation

In this chapter, I'd introduce the case of my previous company (SUMITOMO Wiring Systems).

I was the production department manager. And I was required to review my plant's P/L in the form (Direct Cost + Planned Cost + All Cost Calculation). In this way, we looked at the P/L in Marginal Profit.

And, most important thing is to improve the Marginal Profit rather than just thinking Cost reduction. And it is required to increase the Marginal Profit than cost reduction.

Does cost reduction affect to marginal profit increase? ...That is not always the case.

## 4. Profit Plan and the management.

Profit is most important management theme as a company.

When Saying "Cost Reduction", always the theme is Outsourcing, Price reduction of Out sourcing, Price reduction of material, Labour cost reduction in efficiency increase, **Muda** reduction in **Gemba** (**Production Gemba** and **Office Gemba**). Such individuals are important subjects. And in this chapter, I would write the flow of profit plan and the management organizationally, planned and systematically.

These FOUR are the main frame of this series. I would write above 4 agendas in series. Now let's look at one by one.

### III. Incorrect Cost Reduction

As I wrote in above introduction, my biggest concern is the wrong thought of cost reduction by managements.

In fact, it is easy to reduce cost, if you don't mind the earning capacity, maintaining corporate capacity.

The ideas of cost reduction, those I call *Painful-cost-reduction*, are:

- Just labour cost reduction in efficiency improvement;
- Just indirect (support) labour reduction with AI & IoT;
- Fixed cost reduction in machines and facilities;
- Material purchase price forced reduction;
- Outsourcing price forced reduction;
- Wrong usage of outsourcing;
- Etc.

These ideas are of course considerable and I don't say it is wrong way unconditionally, but it is quite true that these ideas are accompanied with pain.

On the other hand, the *No-painful* ideas are:

- Labour cost reduction in efficiency improvement and with sales development;
- Quality improvement and quality cost reduction:  
Quality cost; Inspectors, scrap loss by defect, rework by defect, claim processing cost, additional material by defect & repair;
- Effective utilization of facilities and machine & equipment with sales development;
- Corrective use of out sourcing;
- Material cost reduction in "true" VA/VE:  
Yield, Alternative material, Workability of machine or labour, Environment, Ease of procurement;
- Direct material cost reduction (with avoiding obsolescence, excess in production planning & inventory control improvement) and scrap reduction;
- Indirect Material cost reduction (Packaging, Oil, Spare parts);
- Indirect labour reduction in changing indirect work to direct work;
- Etc.

Above list are the general ideas of cost reduction.

By the way, I can't bring myself to like the word of "Cost-Reduction". Although, there are many bad memories about the word of Cost Reduction. One of these bad memories is the Exhaust gas scandal of Volkswagen. Probable you remember this scandal.

In almost same timing there was a scandal of construction work in Japan. Those days an apartment house was constructed. But unfortunately, this apartment was done in a corner-cutting. Some important pillars which are protect the construction from an earthquake were not reached to the bedrock.

These examples which are intended to reduce cost are too many to enumerate. But I don't intend to write such issues which are the morals of management. One of reason (which is a main reason) is above painful cost reduction.

In above, I wrote the activities of cost reduction and I say ***painful-cost-reduction*** and ***no-painful-cost-reduction***.

I believe it is no necessary to explain regarding "***no-painful-cost-reduction***", because you can understand well. Thus, in here I concentrate to explain regarding "***painful-cost-reduction***" which I called cost reduction misunderstanding.



### **Just labour reduction in efficiency improvement, and Just indirect (support) labour reduction with AI & IoT.**

It seems to be good. But it is required to dismiss surplus employees.

I was in Mexico and India, and both places experienced very high turnover ratio. In Mexico it was in Chihuahua Juárez near to Texas El Paso and so-called Maquiladora.

It was easy to control the monthly labour capacity (number of Gemba employees), because of the very high monthly turnover which is more than 20%). Therefore, there was no pain by employees. The situation in Bangalore (now Bengaluru) also was same and it was easy to control the Gemba employees and no necessity of dismissal. But normally, a reduction of labour with dismissal is painful.

Recently a strong enemy as labour employees is appearing (appeared). It is the appearing of AI & IoT. And, it is said that almost 50% of current jobs are replaced to AI & IoT. Then, as managements, what the countermeasures are.

Although and of course, it is necessary to retraining of employees. But it cannot be the fundamental solution. Even if retrained the surplus employees, what jobs you can give. And, the solution is, even I know that saying easy, but... Thus, I need to say that the answer is to increase Sales for giving alternative jobs.



### **Fixed cost reduction in machines and facilities.**

If you can sale surplus facilities, machines, you can reduce the depreciation (fixed cost). And it can be no painful cost reduction. However, it is required to consider the issue of future corporate capacity which could be decreased.



### **Material purchase price forced reduction; Outsourcing price forced reduction.**

In this issue I have unforgettable occurrence. And, I have learned the different ways between Nissan and Toyota. The story is described below.

#### **The case of Nissan**

This sudden announcement was made at 2004 June and was surprised the world. And "**this news was discouraged not only the employees of this plant but also the parts & material suppliers.**"

Above is the heading of a Newspaper. Yes, this is the story of closed of Nissan Murayama Plant. But an untruth was included.

Actually, this plant was started to reduce the production in the reorganization of production from 2001. And, at 2004, this plant finished to close completely. However, the threat as suppliers wasn't introduced so many by Newspaper.

Mr. Carlos Ghosn joined Nissan at 1999 June, and he pushed forward the "Nissan Revival Plan". The story of Murayama Plant Closed also the part of this activity. And, in this *Nissan Revival Plan*, it was required to all suppliers a purchase price reduction 20%. 20% price cut! It was indeed shocking.

As an exchange condition, Nissan offered to increase the trading volume. Conventionally a mass production parts is ordered to plural (2~3) suppliers for cost competition and the stability of supply. But Nissan planned to put together to one supplier. Then, he pushed strong price cut to all suppliers (of course my previous company also included). Consequentially, many suppliers lost the business.

How the case of my previous company (Sumitomo Wiring Systems) who is a wiring harness supplier was.

According to my old friend (Sales department person), Sumitomo Wiring got very hard negotiation by him. It is actually price cut requirement simply with no exchange condition.

In fact, it was (is) impossible to consolidate to just one supplier, because the wiring harness industry is the oligopoly state by big 2 suppliers in Japan. And, my previous company is one of 2. However, the price cut requirement was strongly made. And it was settled by political solution. These 2 companies didn't accept 20% cost cut, but cooperated to some cost cut.

The victims were smaller suppliers and the employees of Murayama Plant. Many suppliers lost the order and went out of business.

The nickname of Mr. Carlos Ghosn was Mr. Cost Cutter. I never deny the activity of cost cutting, however his way incurred public odium and lost important customers. The employees of Murayama and the small suppliers who were eliminated forcibly were enthusiastic fans of Nissan car. He lost these funds.

### **The case of Toyota (And the case of Toyota division of Sumitomo).**

Also, very hard negotiation with no compromise. But the Toyota division of Sumitomo doesn't become in the red. And there are some secrets:



#### **One is the ordering system.**

It is very stable and peace of mind with monthly confirmed order and 3 months forecast. It is a big difference to other car makers.



#### **Another one is the guidance.**

When a supplier gets the difficulty of getting profit with the cost reduction requirement, a team is provided by Toyota. And the Toyota team visit the supplier for the guidance.

It is never so kind. Just they looking around and check the **Production Gemba** and give the task to improve with sever timing schedule. Of course, it is required to make the action plan by the supplier (but no necessary to submit). And, the guidance is continued regularly. They teach nothing but just looking around and make very simple comment.

The improvement is given the task to self-improvement by the company. And, once again, as the result, the suppliers don't become red.



## Wrong usage of outsourcing

There are many companies wrong use of outsourcing (see the Teaching Company in TPM-11<sup>2</sup>).

I explain the wrong outsourcing use with the case of "Teaching Company". And, the origin of the wrong outsourcing policy had 2 reasons.

One is the belief that in-house production to be high cost and outsourcing to be lower.

Another is the voice of Sales department, which are, for instance:

- ✓ "It is not possible to make sales promotion, because the cost is too high".
- ✓ "There is no cost competitiveness for sales promotion".
- ✓ "The cost is too high to sell",
- ✓ "I hate receiving order in the red<sup>3</sup>".

The Sales department of this company had a doubt about the Cost. Let's look at both reasons one by one.

### Believing that in-house production to be high cost and outsourcing is lower.

Cost, the key word of origin of misunderstanding is both of them Cost. However (as I wrote before) the meaning of cost is very much uncertain.

For instance: When saying that the cost of office supply, the cost contents are externally purchased items. And the numeral is used alone as "cost".

And when saying the cost of production Gemba, it is required to calculate from both direct costs and indirect cost.

- ✓ **Direct costs which are used for the products:** Direct materials, direct labour, utility cost, air & water which are used for production directly.
- ✓ **Indirect cost:** Indirect labour in **Gemba**, indirect materials in **Gemba** and **Gemba** welfare. The **Gemba** indirect cost such salary of manager, supervisor, **Gemba** welfare, safety materials, depreciation of machine & equipment (which are belonged in the factory) etc. are possible to calculate as the unit of the factory. And when it is necessary to calculate the individual products or sections cost, it is required to allocate based on the (for instance) standard hours.

Above are the **Gemba** original costs.

- ✓ On the other hand, as a company, it is necessary to calculate the indirect cost such head office expenses, patent, sales operation cost, indirect labour (office workers), land & building, depreciations etc. And, these also are necessary to reflect to corporate costs.

<sup>2</sup> TPM-11: <https://archive.org/details/tpm-11-oil-control-ii> & <https://archive.org/details/tpm-11-control-de-la-lubricacion-ii>

<sup>3</sup> Order in red: Order made below the habitual tariff or price.

In the past report, I described *Cost* as:

$$\text{Cost} = \text{Variable cost} + \text{Fixed cost}$$

And, also;

$$\text{Cost} = \text{Direct cost} + \text{Indirect cost}$$

Saying the same word as *Cost*. But, as we seen, *Cost* has some faces.

Then, is outsourcing cheaper? ...The company (of Teaching Company. TPM-11<sup>4</sup>), I strongly suggested to stop the outsourcing policy as the urgent countermeasure for the hemostasis of flowing out the profit. This company had the capacity of not only the labour, machines but also the control. However, in spite of having capacity, this company had such wrong outsourcing policy. But why? ...

The reasons were that the voice of Sales manager who said there is no competitiveness, because of too high cost. And the top management (president) agreed with him. But the president had other intention which was to increase sales soon and to use the in-house capacity.

I made discussions with the Sales department manager and Production manager.

One conversation was about the story of Break-Even Point and stopping outsourcing policy in TPM-11. Omit in here, but the conversations were as next:

—Do you think that outsourcing is cheaper than in-house production? For instance, comparing some products part number? —I asked.

Then the Production Manager answered —Unfortunately, it is quite clear when comparing the costs.

—It is quite true that we don't have the cost competitiveness for sales —the Sales Manager replied, and pointed out finally—, because of the cost. When comparing the cost in some typical products, the outsourcing prices are cheaper than in-house production. We compared and confirmed the truth.

—Please let me know you comparing cost more exactly —I asked then—. What is the cost of outsourcing case? And What is the cost of in-house case?

—Outsourcing cost is simply the contract price with the outsourcing company —Sales Manager answered—. In-house production cost is given by the accountant and is calculated with the factory unit cost.

—Let me confirm that Outsourcing purchase price vs Factory unit cost —I asked and then I questioned—. Am I right? ...Did you compare as this? ...So, what are the contents of factory unit cost? —I tried to explain in deep as next:

*Unit cost = Direct labour cost (Production workers, foremen) + Direct materials + Indirect workers (Factory manager, supervisors, material handlers, shipping, material controllers, maintenance technicians, inspectors etc. ---) + headquarter, offices etc.*

—Therefore, when comparing "Outsourcing purchase price vs Factory unit cost" it is true that outsourcing is cheaper. However —I pointed out—, for outsourcing, it is necessary the indirect cost of the factory such receiving inspection, material handlers, shipping workers, outsourcing control

<sup>4</sup> TPM-11: <https://archive.org/details/tpm-11-oil-control-ii> & <https://archive.org/details/tpm-11-control-de-la-lubricacion-ii>

(process control), accountant staffs and others. As the result, you have the section of outsourcing control. When occurring a quality problem, your quality department is required to process for it.

—Such indirect cost also must be calculated and allocated into the outsourcing cost. So, again, if comparing the Outsourcing purchase price vs Factory unit cost, it is completely wrong way. —And then I asked —, Is outsourcing cheaper than in-house production? ...Because I saw some shipping & receiving inspectors who inspect the quality before delivery and receiving products which were made by outsourcing.

Is outsourcing good quality (at least better than in-house)? ...For quality improvement I advocate QRQC (Quick Response Quality Control). How do you improve the outsourcing products quality? ... Thus, I cannot recognize the advantage to use outsourcing.

At that time both Production Manager and Sales Manager didn't answer.

In fact, this Teaching Company had such illusion which the cost of outsourcing must be cheaper than in-house production.



#### The use of outsourcing (from TPM-11<sup>5</sup>):

- To supplement the function being insufficient internally.
- Need equipment and technology not available in the company.
- To cover fluctuations in demand. Demand fluctuates greatly and fixed
- To cover fluctuations in demand. Demand fluctuates greatly and fixed resources cannot be kept

When using outsourcing without above conditions, it is quite natural to have the adverse effects which flowing out and decrease of internal reserve, not possible to cover the fixed cost and then (even though) increase in sales, but decreasing in profit.



#### QRQC (Quick Response Quality Control)

I will explain this issue in TQM (Total Quality Management) in detail. But now and very shortly:

For improving quality, it is also important the “Total” and “multifaceted activity”.

Multifaceted activity: At the stage of R/D and designing, transferring to Gemba (Initial products quality control - IPQC), mass production and traceability and total management system (policy, KPIs, Target setting and review & evaluation system).

QRQC is a Gemba activity with “*All peoples participation*”. And, one of essential factor is the feedback speed. It is important to see or understand or presume or assuming the causes. I teach the techniques such FMEA, QC-7 tools, QC flow chart, QC process diagram, IPQC (Initial Products Quality Control) etc. And this QRQC is one of main pillar of my TQM.

<sup>5</sup> TPM-11: <https://archive.org/details/tpm-11-oil-control-ii> & <https://archive.org/details/tpm-11-control-de-la-lubricacion-ii>



### **"I hate receiving order in the red"**

In above, I wrote the costs of outsourcing and in-house production. However, still there are the points to consider to the voice of "Cost is too high" and "Receiving order in red".

Firstly, the words of "Cost are too high" and "There is no cost competitiveness for sales promotion". I felt that it was really true, because of the high-cost constitution (See TPM-11<sup>6</sup>).

And, it was no doubt that it is required to solve the high-cost constitution. Thus, for resolving it, I recommended the additional activities after the introduction and stability of Total Preventive Maintenance. In this way the main pillar of this activity or which I recommended, is TQM.

When I made the discussion with Sales, Production and Financial directors, I decided to draw my hand from this company after TPM. But anyway, I told them that TPM cannot be the solution.

Cost reduction has 2 countermeasures: One is reduction of Absolute-cost (fixed cost and variable cost) and another one is Relative-cost (sales increase).

For Absolute cost reduction, I don't want to say "cost reduction", but "Muda reduction". (First of all, I don't like the word of "Cost Reduction"). Indeed, Cost-reduction and Muda-reduction are completely different.

But for now, I focus in the voice of "Receiving order in red".

Actually, the sales department was prohibited to make sales promotion with "Receiving order in red". And previously the sales department made a sales promotion involving sales amount & number competition for getting new customers. But the act of "Receiving Order in Red" overshot for main products was criticized by management. And since then, any Receiving Order in Red was prohibited.

By the way, they had a new product which the sales department wanted to promote strongly. But the sales planed & expected price didn't accept by the customers. The customers required the price reduction. But the sales manager judged that the price reduction became "Receiving order in red" and to refuse the new business. And, then this company lost the opportunities of sales expansion.

This company had sufficient machine & labour capacities against the sales expansion. However, the opportunities were not taken the advantages. Let's say first from the answer. In some cases, even though "Receiving order in red", the order should be accepted.

What kind of situation was?

$$\text{Profit} = \text{Sales price} - \text{Cost (Variable cost} + \text{Fixed cost)}$$

And, for gaining profit the condition is;

$$\text{Sales price} > \text{Cost}$$

This is an obvious thing. However, again, in some cases, even though "Receiving order in red", the order should be accepted. Exactly, above case of this company should receive the orders for the future business expansion.

<sup>6</sup> TPM-11: <https://archive.org/details/tpm-11-oil-control-ii> & <https://archive.org/details/tpm-11-control-de-la-lubricacion-ii>

Let's look at severer example than this company.

You know and as you also are experiencing the Pandemic situation (COVID-19). The place is Tokyo (no necessary to be Tokyo but actually anywhere worldwide).

A restaurant began the lunch menus which are cheaper than normal price. Moreover, it is the situation of "Receiving order in red". But this restaurant needed to begin these cheaper lunch menus, even though the prices are in "Receiving order in red" for connecting life. Why? ...

Why is it necessary to the cheaper lunch menu in spite of "Receiving order in red"? ...The case of this restaurant in Tokyo is as next.

- ✓ Fixed cost/month; \$ 20,000. (Rent expense = \$ 10,000. Salary, loan and other expenses = \$ 10,000)
- ✓ Variable cost/month; Material cost and others = \$ 30,000
- ✓ Total expenses; \$ 50,000

Fortunately, the strategy went well and got the income \$ 40,000 in a month.

- ✓ But P/L calculation was **-\$ 10,000**.

However, it was (and is) corrective decision. Because, if it wasn't made the strategy, the result of income was zero. And the meaning of "income zero" is that it was not possible to gain even the fixed cost (\$ 20,000).

To continue the business, the decision was correct, even though it was "Receiving order in red".

What was happened after that? ...This restaurant implemented second strategy which was to expand the Takeout, own delivery service and traveling sale (visiting an area to sale cuisines).

Particularly the traveling sale by staffs is very much succeeded. And as the result of P/L is although not profitable, but it is not in red so far (even though the loan was increased because of preparing new car for traveling service).

How was the case of the Teaching company? ...The sales department of this company was prohibited "Receiving order in red". But this company needed to allow "Receiving order in red" in some considerable conditions which are:

- ✓ Expectation of sales expansion.
- ✓ Expectation of internal cost reduction to the profit recovery.

This product which Sales department expected the sales promotion was in both above conditions. Therefore, this company had to accept the situation of "Receiving order in red" for this product. And of course, it is necessary to effort internal cost reduction activity.

As I wrote before, the factory of this company had many **Mudas** which were possible to resolve in corrective factory management.

And, there are 2 ways for cost reduction: One is reduction of **Muda** in all production process (from receiving order to shipping). Another one is to increase sales. So, sales expansion is effective measures to reduce fixed cost relatively.

In the next lecture I would write about What is cost.

## IV. Oil Control III

### An episode-1 (Mr. Suzumura).

Before this main theme, I would introduce an episode which I learned at the age of Tokai Electric Wire (antecedent of Sumitomo Wiring Systems). At that age I had a memorable teaching by a Toyota person (K. Suzumura).

As I wrote in Making Stream of Production-10 (Kanban System). His teaching and support of Kanban system introduction was the disappointing result. But one point there is a remarkable teaching.

When he visited our factory, his firsts voices were:

- What a dirty factory it is!
- That window glass has been left broken.
- Fix it! Clean up!

And then, his team went away. It was only 10 minutes. Their first visit was finished. His behavior was indeed outrages.

For the second day, we clean upped carefully, of course repaired the broken window glass. Then he looked around the factory grumpily. When coming machine area, again he told us grumpily.

- What a dirty machine it is!
- Tokai Electric Wire is a very rich company, are you?
- Willingly shorten the life of machines, do you?
- A machine is alive and breathing. And are you going to suffocate him?
- You indeed cleaned up, but only where you can see.
- Shine machine!

And, his second visit end up.

The next day, a parson of this Toyota member, who later became a Managing Director of Toyota, phoned me and taught next things:

1. 5Ss;
2. Importance of 5Ss in invisible place. In the spirit, mind. And, for keeping quality and machine maintenance;
3. Importance of visual control which visualize invisible place and information and share with all people.

And about machines He told me:

—Machine is breathing. This is true. Your machine also has the oil tank and breather. At that point was dirty when we looked around. If around of breather is dirty, small tip & dust comes into the oil tank and foul the circulation oil —and he continued.

—As you know, a circulation oil is like blood of machine. And, the tip & dust sticks in the drive part. As the result you shorten the life of machine.

(As I wrote before, more than 60% of drive part failure is caused of oil.)

Thus, about spirit and mind He spoke as next —Tokai is normal level. No. Actually a little lower level than other companies which we (Toyota teaching team) visited. But never mind it is possible to improve.

—But please remember that the company who corner-cuts the cleaning up of invisible parts cannot sustain good condition of machines and factory. Moreover, most of machine have the central part in invisible area. Therefore, when we visit a factory, we look at carefully the invisible area where the factory's people don't want to show.

Mr. Suzumura told that “Shine machines”. His intention is to teach the spirit & mind of keeping clean.

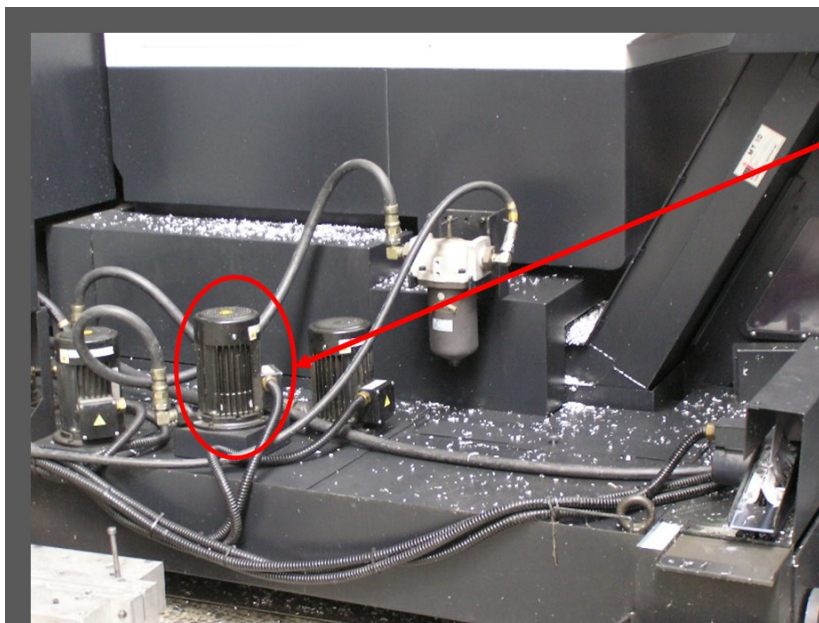


### The word of 5Ss

At that time, there wasn't the word of 5Ss, but was the log & poster of 「整理、整頓; *Seiri* & *Seiton*」 in the wall of any company. Yes, in any company. And it is been teaching as *Shitsuke* in any home. And, Toyota (T. Ohno) added *Seiso* and *Seiketsu* in the conversation with Shigeo Shingo. Since then, Toyota began to use 4Ss.

Sumitomo W.S succeeded this spirit as the *Pika-Pika* activity.

When writing “Prevention of scattering (TPM-8<sup>7</sup>), I used next photo:



What dirty this machine is!

What is this?  
Is this Breather?

<sup>7</sup> TPM-8: <https://archive.org/details/tpm8preventionofscatering> & <https://archive.org/details/tpm8prevenciondeladisersion>

Dirty. It is indeed dirty. And, I remembered the word of Mr. K. Suzumura "You shorten the machines lifespan".

One of cause of shortening lifespan is the lack control of hydraulic oil. Generally, it is called that a hydraulic equipment is the heart of machine and the hydraulic oil is the blood.

A large amount of hydraulic equipment is used in the production equipment of factories. Instability or failure of hydraulic equipment means that production will stop as it is. So, to speak, it is the heart of production equipment and the most important equipment. Hydraulic equipment requires hydraulic oil as a medium for transmitting force and as its own lubricating oil. Hydraulic oil is the blood of hydraulic equipment and machinery.

Contamination of hydraulic oil with dust directly leads to failure of hydraulic equipment.

Contamination control of hydraulic oil is the most important for stable operation of production equipment. Yes, I have witnessed the problem of hydraulic oil.

(I believe I wrote this episode in somewhere. But once again.)

## **An episode-2 (a manufacturing company).**

When making lecture in a company, suddenly all machines & equipment of the factory were stopped. Yes, the entire factory was shut down.

Soon the maintenance manager who was one of my students attending my lecture went to the factory to grasp the cause.

Then, He came back to class room and reported to the factory manager.

It was the problem of an air compressor which supplied air to all machine tools and facilities. Then as his report, soon it was recovered. A spare compressor was driven. However, and again, entire factory was shut down. We had no way to do it. And the shutdown was continued from 10 o'clock to next day noon.

According to the report of maintenance engineers, the cause was the spare compressor also broken down in same reason. The root cause of 2 compressor broken down was same and was the deterioration of hydraulic oil.

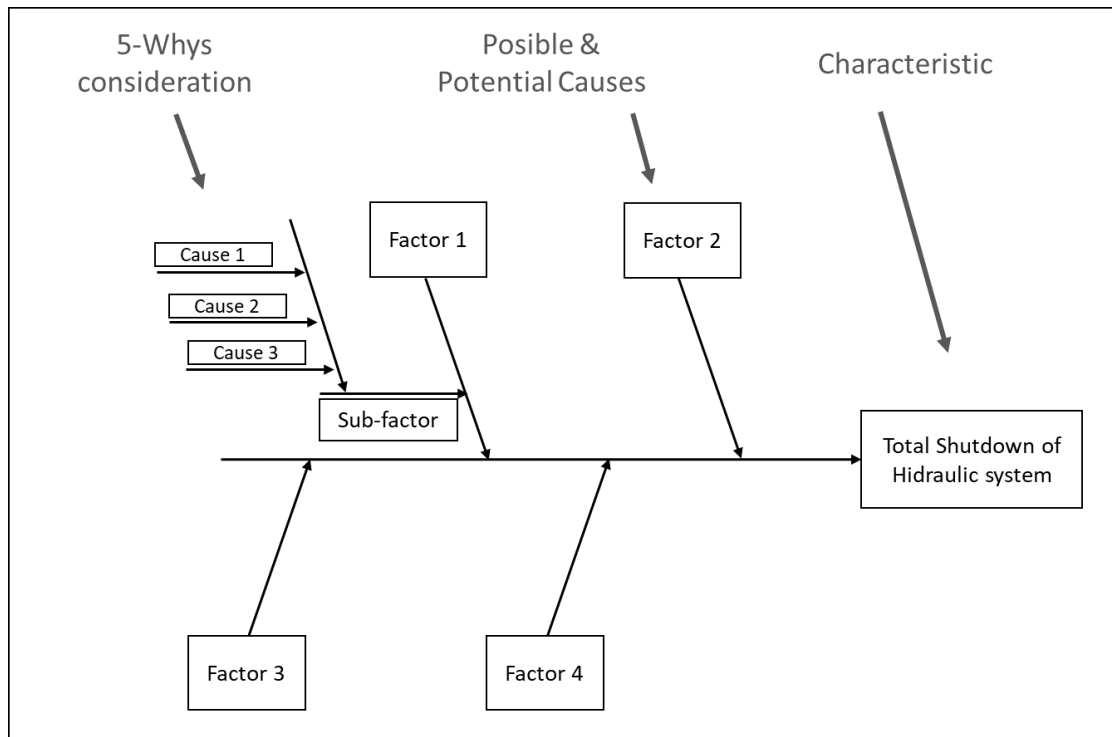
As you know there are 2 types of air compressor. One is Oil free type, and another is Oil refueling type. This company used 2 Oil refueling compressors (One Large-size and another one Small-size). The small size one was as a spare. But at that time, both of them were shut down with same cause. It was perfectly we could say nothing.

The refueling compressor lubricates the metal contact area inside the compressor body with oil.

When occurred the trouble, I was teaching 5Whys analysis in Fish-bone diagram in TQM. Then the students divided to 5 groups tried to make the fish-bone diagrams with 5Whys.

Based on the analysis, they concluded the root cause as deterioration of hydraulic oil. And, the main 3 causes of deterioration are Heat, Abrasion (Wear) powder, Suction dust.

- Heat & Abrasion powder: Hydraulic pump is made very precisely to generate high pressure. Also, unlike other equipment, the metals move while being in direct contact with each other with a strong force. It is the oil film that prevents wear, but since it cannot be completely prevented, wear progresses, albeit slightly. Heat also deteriorates the hydraulic oil. And the cause is same to above.
- Suction dust: It is another serious cause.



### KJ-Method & Ishikawa diagram

By the way, as I wrote above, I was teaching TQM at that time. But because of the trouble of entire factory shut down, this company strongly required me to switch the teaching TQM to TPM. The contract with this company was just 2 years.

Then I told them that there is no existence TPM with no TQM. Also, there is the proverb and says that “If you run after 2 hares, you will catch neither”. And, my time given remain not much.

As you experienced the true Fish-Bone Diagram with 5Whys, TQM is essential for your wish (TPM introduction).

For instance, the failure at that time was defined as “Entire factory shutdown caused of Hydraulic system failure” in the Fish-Bone Diagram. A little long word as defining. But they wished this to share the severity of this trouble.

Why did Hydraulic system failure occur? ...They made a Fish-Bone Diagram. And, the process is:

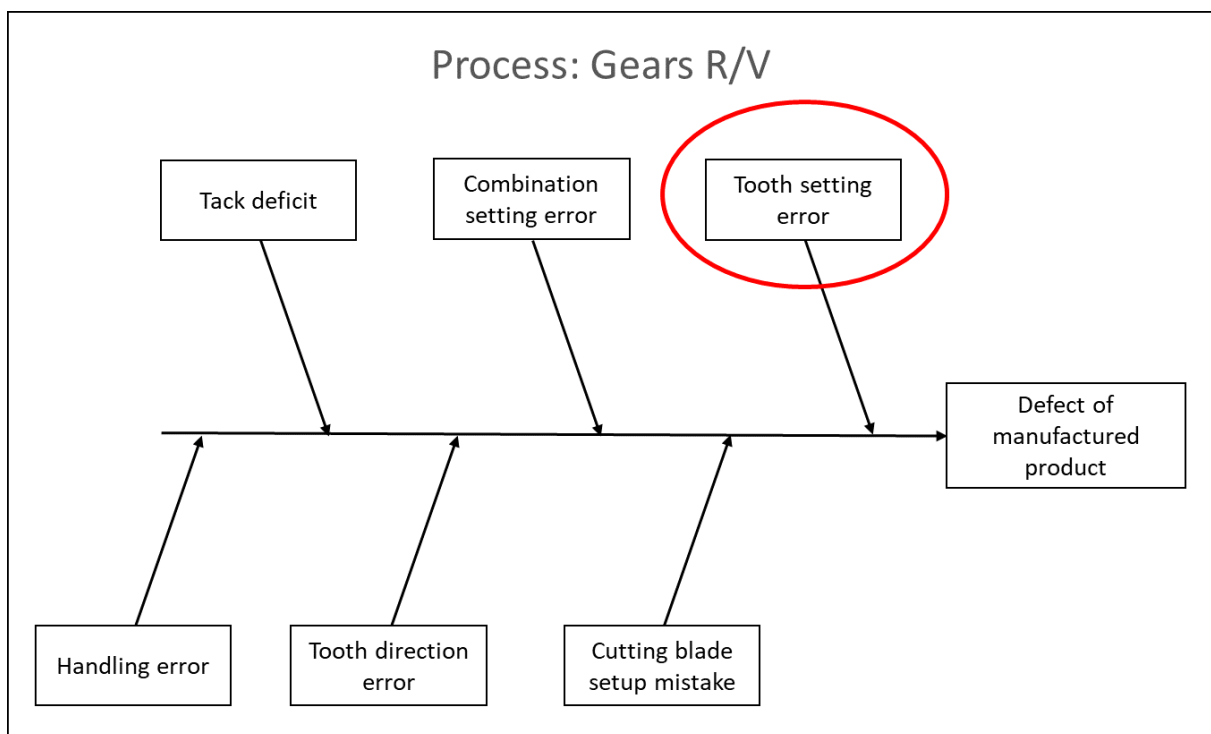
- ✓ Free talking and having free ideas with using KJ method (writing cards).

They wrote down more than 600 cards (5 groups total. It was indeed many cards written up.) As I wrote before, the rule of KJ is: ① No criticism; ② All voice to be recorded in cards (duplicate opinion also); ③ Short sentence in one card; ④ One card one idea and; ⑤ Any cards not to be neglected.

- Listing up of possible and potential causes;
  - Distributing cards in large paper;
  - Sequencing cause and effect (making cards of additional new ideas);
  - Finding “possible & potential causes”.
  - ✓ Distributing and sequencing cards in each “possible & potential causes” with considering 5Whys.
  - ✓ Making base of Fish bone. (Below figure is the image.)
- I cannot introduce actual pictures, because of the confidentiality. Therefore, please imagine it with the reference pictures.

A little more, let’s look at the example of Fish-Bone Diagram with 5Whys (I use this example in TQM and describe more exactly. But in here, just image.)

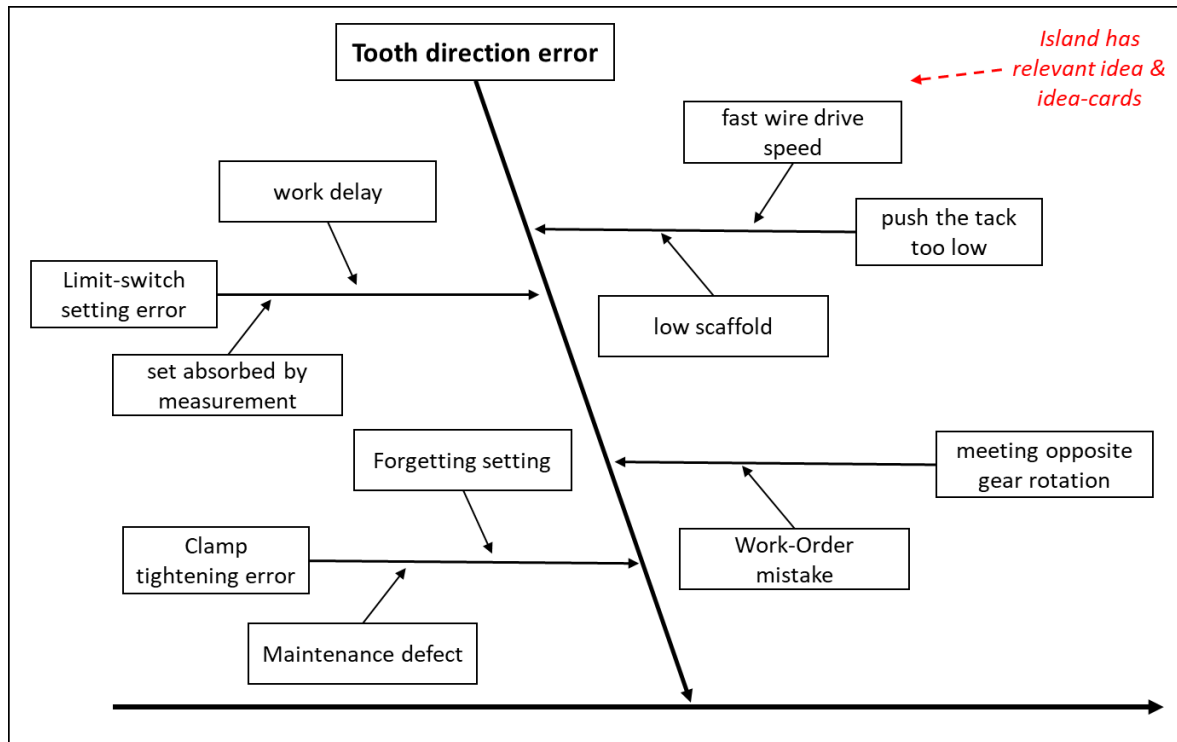
For instance, this group picked up the defects of finished products. Making cards of KJ method, and then choosing biggest themes as first Why. In this case nominated 6 themes.



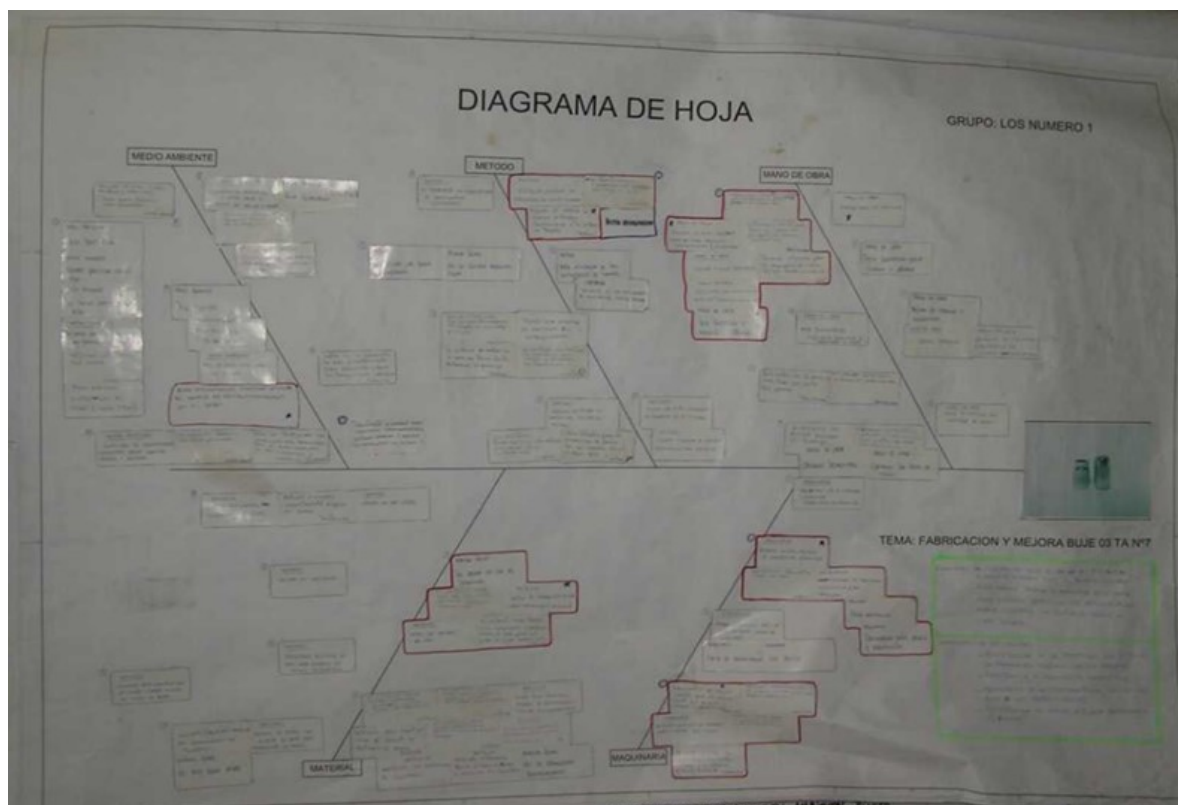
For instance, in those 6 themes, there is the theme of “cutting blade setup mistake”. And, distributing relevant cards and making islands. Large island mentions many cards, and degree of deeper concerns.

Below image is just image, and just bones. And, when making this diagram, it’s more like grape tree than fish-bone, because all cards are put in this tree with any cards not to be neglected.





The image is like as below. Thus, actually, below one was made by Gemba workers group. But of course, duplicated, triplicated or even more cards also are put.



KJ method is very useful technique to have and create ideas. And, I succeeded to reach to root causes with this technique which is the combination of KJ, 5 Why and for instance Fish-Bone, FMEA, Fault Tree Analysis in my experience.



Returning to the issue of this company.... This middle-class industrial company has many machine tools. And one of major machine trouble and concern was **Choko-Tei** caused with hydraulic system.



### **Choko-Tei**

**Choko-Tei** is a Toyota word.

- **Choko** (Choko choko): Frequently;
- **Tei** (Teishi); Stop.

It is the word of expressing the situation of machine stop less than 15 minutes.

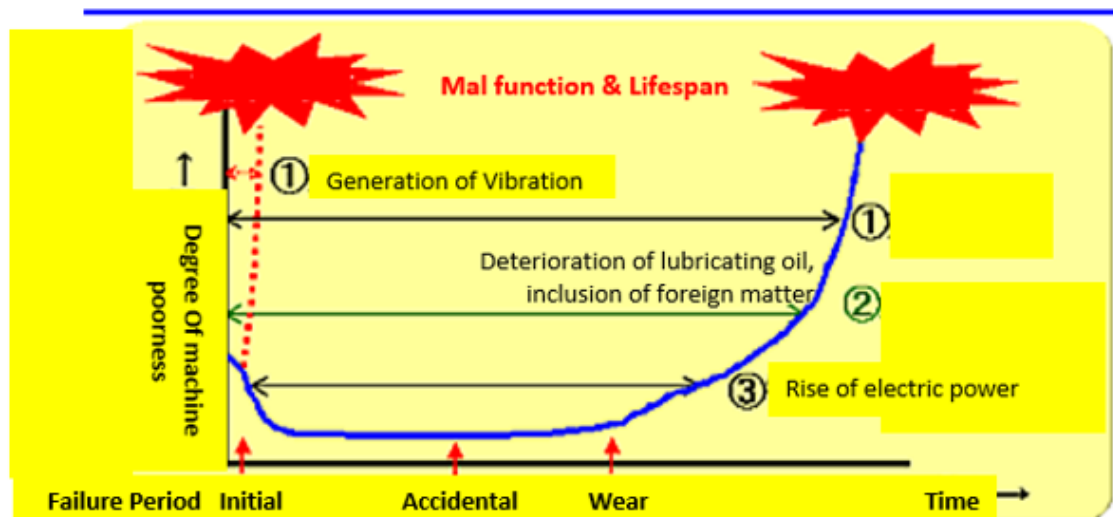
In Making Stream of Production-3<sup>8</sup>, I introduced this word with Sumitomo standard. And, definition of machine breakdown is more than 15 minutes stop in machine trouble. But, definition of **Choko-tei** (Machine stop Frequency) is less than 15 minutes in machine trouble.

Then, I taught to watch the degree of Oil Deterioration.

The major causes of deterioration are (as I wrote above) again: Heat, Abrasion (Wear) powder, Suction dust. And, the machine troubles nature and frequency are different in the stages of bus-tub curve. (TPM-10<sup>9</sup>)

Therefore, it is difficult to standardize the checking frequency uniformly from the stage of brand new to old. And one of powerful countermeasure to measure the machine's condition is the check of oil dirt. Of course, the frequency of oil check is different depending upon the stage of "Failure Period Initial, Accidental and Wear".

### Positioning of lubrication management in the Bathtub Curve



<sup>8</sup> Making the Stream of Production-3: <https://archive.org/details/makingstreamofproduction3/mode/2up> & <https://archive.org/details/establecerlacorrientedeproduccion3/mode/2up>

Making the stream of production 0-14:

[https://archive.org/details/makingstreamofproduction13\\_202001/Making%20Stream%20of%20Production-10./mode/2up](https://archive.org/details/makingstreamofproduction13_202001/Making%20Stream%20of%20Production-10./mode/2up) & Establecer la corriente de producción 0-14:

[https://archive.org/details/establecerlacorrientedeproduccion13\\_202001/Establecer%20la%20corriente%20de%20Producci%C3%B3n-14](https://archive.org/details/establecerlacorrientedeproduccion13_202001/Establecer%20la%20corriente%20de%20Producci%C3%B3n-14)

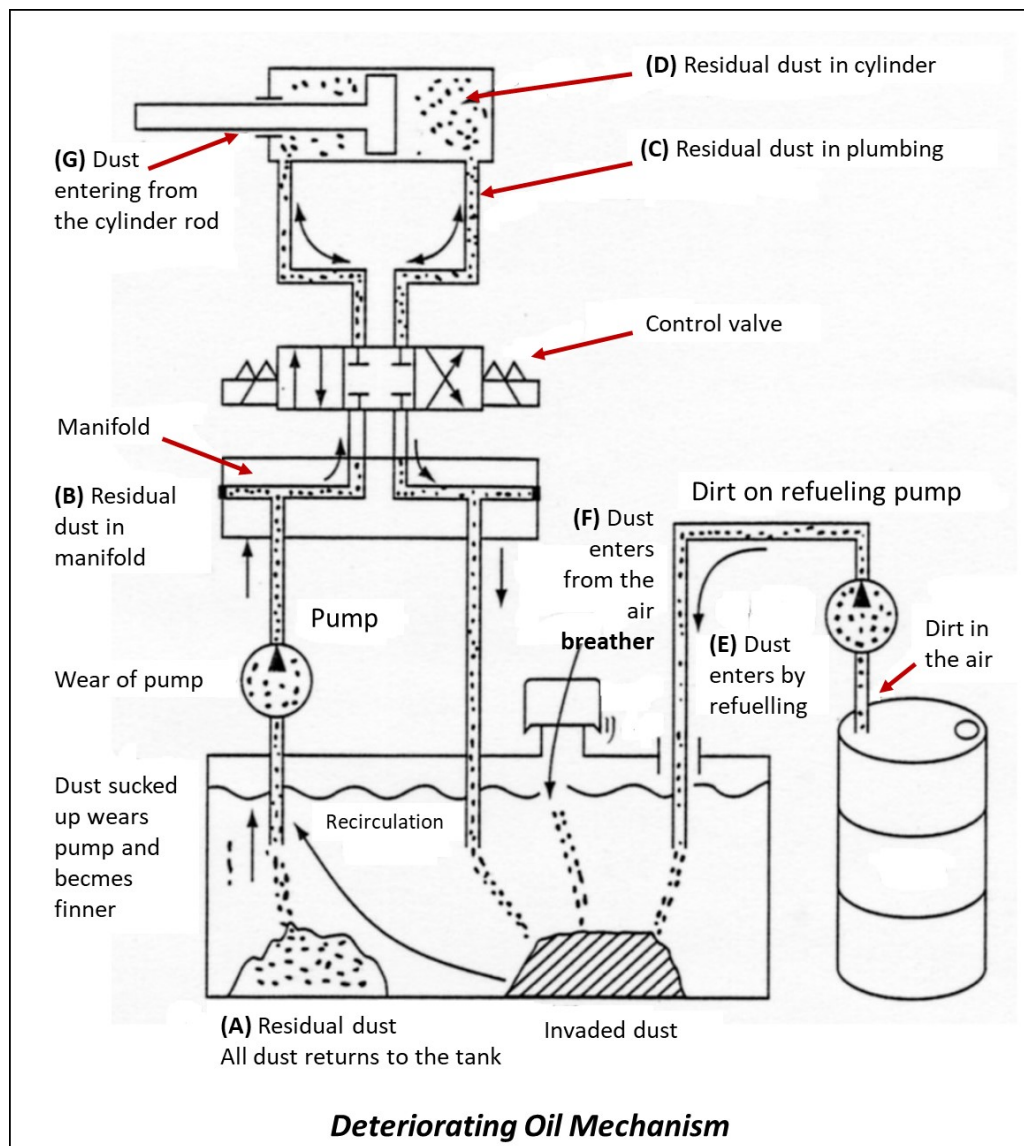
<sup>9</sup> TPM-10: <https://archive.org/details/tpm10employeeengagementoilcontrol> & <https://archive.org/details/tpm10elcompromisodeltrabajadoryelcontroldelalubricacion>

Now, this company had the **Choko-Tei** trouble. And, according to the investigation in the Fish-Bone and 5Why analysis, the major cause was the hydraulic system and the control of hydraulic oil.

At that time, I remembered the face and behavior of Mr. K. Suzumura. And, I found that I also was teaching same contents (But I never was unmanned and arrogant like as him): A machine is your important partner who cannot tell neither complain. Therefore, please clean up and shine it to every corner and inside machine. Then you can find a trouble and abnormality. Please make blood test. As a machine hydraulic oil is like as blood. Please never corner cut to machine 5Ss.

And, I taught the mechanism of oil deterioration (In fact, the oil deterioration caused of the sensor trouble which is one of major cause of **Choko-Tei**).

In here I explain the mechanism of oil deterioration with next picture which is opened by a Japanese lubricant industry in his site, and is better than my explanation and may be no necessary additional words.



This teaching company made additional Fish-Bone Diagram with 5-Whys and KJ-method for machine tools **Choko-Tei**. And, as the "Possible & potential causes", they chose next:

- ✓ Wrong setup, Misuse parts, Over load, Sensor malfunction, Abrasion (Wear) of parts, Misuse lubrication, Hydraulic oil deterioration.

They (5 groups) chose different machine tools (but same kinds) which were main production equipment of this factory.

Then they investigated the maintenance record, as far as possible.

Unfortunately, the PM (Preventive Maintenance) and maintenance record was not sufficient. They disappointed the incomplete PM records and required my advice to advance their QC Circle activity.

Thus, I suggested next 3 ideas.

1. Use KJ-method.
2. Hearing the voice of operators. (Involving operators)
3. Investigate the PM records with open eyes (even though to be not enough record).



#### KJ method<sup>10</sup>

This method is used not only for creating ideas and unexpected ideas discovery, but also intensify and aggregate the trend and data.

Consequentially and in this case, I suggested to use it for aggregate trend & data.

For writing up KJ cards, they invited operators and asked them to attend this “game”.

In this way they made up huge large “Possible & potential causes” map.



#### Possible & potential causes

One story... A person declares the cause of this crack in this metal product to be objects getting into the die.

And they take the countermeasures such complete 5Ss around the machine, cleaning automatic devise which can clean up each shot.

After these countermeasures, again and suddenly same defects occurred. They checked the Gemba and the countermeasures implementation situation. And then, again, they concluded that the reoccurrence of same defects in the products is: Insufficient implementation of the countermeasures.

And the countermeasure was: Completeness of these countermeasures. But same defects occurred in next production lot. Then they realized finally that.

---

<sup>10</sup> The KJ-Method is also called Affinity-Diagram in some methodologies. It is explained in Sensei Koichi Kimura's first readings: <https://archive.org/details/to-my-friend-and-kj-method> & <https://archive.org/details/a-mi-amigo-mio-y-metodo-kj> It is also described in the book “The System of Excellence”: <https://www.amazon.com/dp/B077SGKSB1> & [https://www.amazon.com/dp/B08XCPRNRK#detailBullets\\_feature\\_div](https://www.amazon.com/dp/B08XCPRNRK#detailBullets_feature_div)

1. The true causes are different.
2. Mistook to effort to find true causes.
3. Must not to declare a cause and make effort to seek causes in wide variety.
4. Because nobody can see the occurrence in the die when just occurred.
5. "To be getting into the dire" and our saying true cause is only one of assumption.

Then we arranged that we never use the word of "true cause", and use "Possible & potential causes" to obtain better "defect cause assumption".

After the investigation, we chose one of defect cause assumption to be the change of elongation percentage of this material. Then, discussing with material supplier and re-standardize the figure of elongation percentage.

A true thing was that the supplier changed the elongation (but inside the standard). Then, the former countermeasures and new one was implemented. And this crack defect was eradicated.

(This is a true story occurred in my factory.)

In the opinion (KJ cards), (of course) there are assumptions & prejudices and personnel impression.

But in the rule of KJ-method, these are also accepted. Because such assumption & prejudice and impression also have root causes in his machine trouble experience.

Unfortunately, there are persons who we cannot involve them. And, I need to add next sentence. "If he/ she has the sense of believing science and has a conscience."

- ✓ **Believing science and conscience:** If he/she hasn't this sense/feeling, it is difficult to expect a sincere discussion.

Related to above story, yesterday (April, 2021), there was an unpleasant News. A person who didn't put a mask came into a store. And, the salesperson asked him to put a mask. But he refused it and came into forcibly. Other customers also tried to stop his act. He shouted "It's my liberty to put mask or not. I'm free". Consequentially, a client called police. And, he was arrested with the suspect of violence to the salesperson and the other clients. In Japan, there is no law to force to put a mask. Therefore, and but is he right?

There were 2 problems in this incident:

1. He didn't believe the effect of mask even though there are some scientific proofs. And he knew these proofs. But refused to believe these.  
I have seen the similar situation in a TV News. There were conflicts & demonstrations of both sides at the previous presidential election of USA.  
One side was shouting opinion one-sidedly. And a psychologist commented and spoke.  
They believe what they wish to believe and claim it is fake if they don't want to believe it.
2. Freedom.  
He shouted "I'm free and it is my liberty".  
I think you know about the incident (indeed terrorism) related to some caricature, in France<sup>11</sup>.  
At that time, I felt strongly that Japanese freedom and French freedom are different. In general thinking, freedom accompanies with "duty and responsibility. Japanese thinks that

<sup>11</sup> Charlie Hebdo shooting: [https://en.wikipedia.org/wiki/Charlie\\_Hebdo\\_shooting](https://en.wikipedia.org/wiki/Charlie_Hebdo_shooting) & [https://es.wikipedia.org/wiki/Atentado\\_contra\\_Charlie\\_Hebdo](https://es.wikipedia.org/wiki/Atentado_contra_Charlie_Hebdo)

we are free, but the freedom should be inside the range of duty & responsibility (to the society. If it has the value to sustain.)

Probably, the French one also same. But I felt that it tends to personnel freedom extremely. When looking at and reading the caricature, I felt why they wish to attack other persons and societies, why not careful consideration to express the thought for not harm good others. (This is just my feeling)

Long years, I taught KJ-method and had unique experience one day in a manufacturing company.

There were machine problems which were not only the machine failures & defects, but also occurred human accident. Then, we tried to make up the potential problem map of this machine. In the cards there were very unique cards which were not scientific.

And the cards said: *"Possessed by evil spirits", "It is necessary to make Devil Exorcism"*

Now how treat these cards and opinions? ...The rule is **"No neglect and no criticize"** and **"accept any ideas"**.

Then this small island also named as *"Loving machine as our avatar"*. And, the countermeasure was to worship the shrine. (In Japan, it is popular to have his own shrine or **Kamidana**; household Shinto altar.)

Again **"No neglect and no criticize"** and **"accept any ideas"** are essential rule of KJ. And, making up of this **"Possible & potential causes"** map is just the start.

Anyway, the Total Preventive Maintenance - TPM activity was started as the Gemba group activities.

Again, at that time I was teaching TQM. And as the Gemba activity, some groups (4 groups) had already started. And, next groups were being chosen. Thus, one group tried to introduce PM-Record and KPIs-Introduction for machine & equipment management and some groups tried to introduce machine-5Ss and Manual.

These groups also were recognized as QC Circle groups. But actually, I recommended to use "Group activity" which is not same to QC Circle which targets to quality issue. But they also used the QC Circle Diagram conventionally.



## 5S + Visual Control

Now, as next, I introduce 2 activities of this factory. It was 5Ss & Visual Control introduction for oil control to resolve the "Possible & potential" cause of "Misuse lubrication".

Their activities were:

1. One was the theme of "Centralized oil control".
2. Another was Visual Oil Control in machine.

Let's look at one by one.

### Centralized oil control (Oil station)

They introduced and improved the they call "Oil Station".

In the QC Circle Diagram, the "Reason for selection" was: Centrally manage the oil used in the company to eliminate unnecessary inventory waste, prevent floor stains caused by oil and misuse of it.

And, in the detail explanation was: Until now, oil was managed near the equipment used and the workplace, but when the same oil was used in multiple equipment, we had to purchase more oil cans.

In addition, the floor is apt to get dirty in places where oil is handled, but managing it in one place makes it easier to keep it clean.

And, the most worrisome thing is that "the case of using something other than the specified one by mistake" actually occurred.

As we learned, these are caused by inadequate oil management, and We thought that it could be improved by centralized management and establishment of 5Ss. Thus, they implemented the oil centuriation and 5Ss as next photo.



Attach the faucet directly. It is possible to pour it up easily.  
Tilt the can a little and use up the oil to the end  
An oil pan is installed to prevent unnecessary oil from polluting the surrounding area.  
Install casters on the shelf itself to clean under and around the shelf.

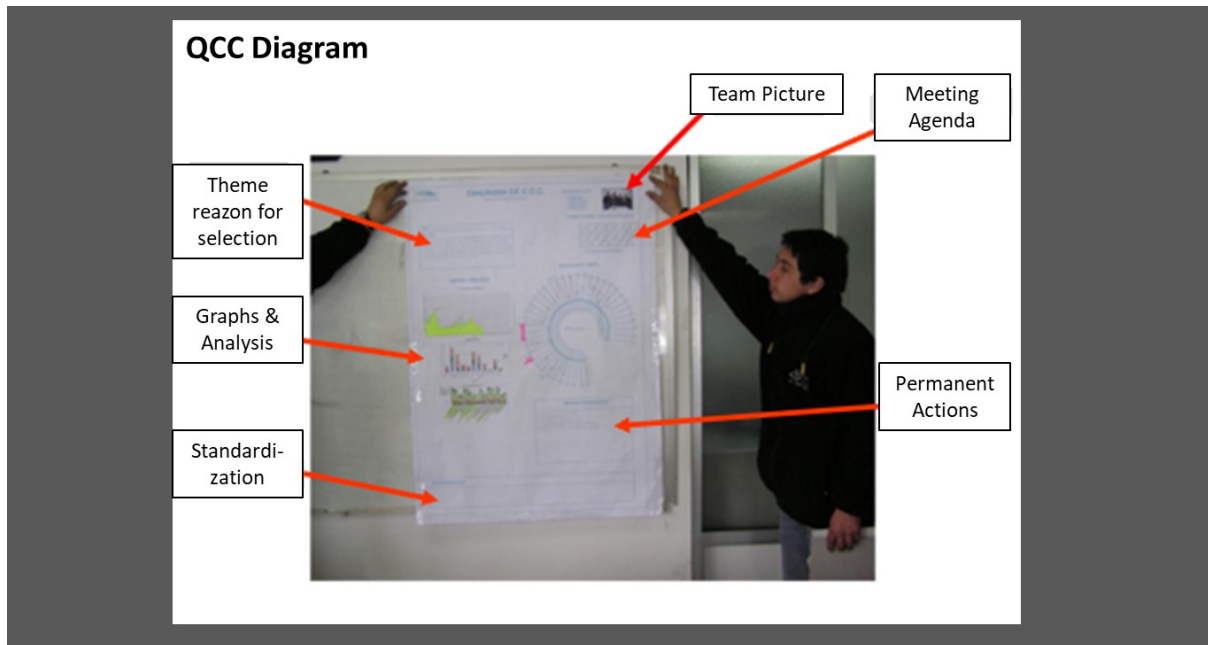
Above photo is an image of the QC Circle. Unfortunately, I cannot use actual photos contractually because of confidentiality.

That group made up the oil station 5Ss as next:

- **Seiri;** Necessary oil should be standardized and identified. No put others.
- **Seiton;** Visual control and localization.  
You can take out as much oil as you need without making a mistake.
- **Seiso;** Clean up for visual control and beautification.
- **Seiketsu;** Keep clean place without oil stains.
- **Shitsuke;** Keep and keep with regular photo and show in bulletin board.

In the QC Circle Diagram, there is the column of Standardization. And they standardized as next:





To keep oil station 5Ss:


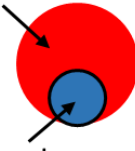
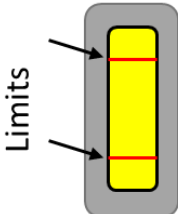








1. Monthly responsible person of rotation by maintenance department
2. Weekly clean up by the responsible person
3. Department manager check at regular factory 5Ss walk
4. Necessary oil standardization and registration

Another example: Visual Oil Control in machine. The "Reason for selection" was: "We learned that about 60% causes of driving part trouble are the defect of oil supply". And, in order to keep the machine tools health, there are the rules:

1. Are you using the correct oil in correct supply port?
2. Is the lubricating oil container, correct?
3. Is the amount of oiling appropriate?
4. Is the oil supply timing & cycle, correct?
5. Haven't you overlooked oil oversupplying or leaking?

We chose this theme to review these points and, regarding the above 4 items, by reviewing our workplace once again and managing the lubricating oil mainly by the operators, that is, by "deciding exactly what the person to keep should protect", we seek to achieve zero breakdowns due to poor oiling. This group tied up with the Centralized oil control group. And, they provided next images oil stand (these are different company examples).



	Supply cycle		Kind of lubricant		Limit
Label	Label 		Cycle label 		
	Supply place: <b><i>Supply mouth</i></b>		Kind of lubricant		
Symbol color		Daily		Operating fluid	
		Weekly		Machine	
		Monthly		Axis	
		Semi-annually			
		Annually			



## Unification of lubricating oil

Now in here, I wish to write the necessity of the unification of lubricating oil.

It is true in our experience that using oil which the machine maker specified is slightly difficult to use properly, because of many kinds. Then, I recommend to unify the kinds of oil. For this purpose,

1. Make the list of oil using.
2. Unification according to viscosity.
3. Use Multi-application oil.

When doing the oil unification, it is necessary to consider above 3 points. But I recommend you to discuss with the machine manufacturer and oil manufacture (who are the specialist about the lubrication).

As above example, keeping oil kinds in several standardized cans and using color coded supply containers are used. Moreover, understanding of instruction manual is important. But about just the lubricating oil just must be considered.

## QC-Circle deployment

By the way, I use QC Circle technique when teaching companies. The reason is anyway it is convenient for teaching. Consequentially, when teaching company, it is necessary to teach not only the techniques (including organization & system), but also to educate the Gemba. Teaching & educating above 3 area is essential for the sustainability.

As I wrote before in somewhere, it is easy to teach and introduce system or technique. But most difficulty is the make up the background which can sustain them (system or techniques). Therefore, I always intend to teach to 3 areas at same timing.



A trouble occurred when teaching TQM for this industrial company.

I have already written the requirement of this company which was to switch the teaching theme from TQM to TPM. And once time I refused this proposal. But the president brought up this topic and solicited the aid to introduce TPM with the period extension.

But I refused this request also, because I already had next teaching schedule to other companies. Then I proposed next 2 things.

- ✓ During the teaching TQM, Group Activity theme to be concentrated to the theme of PM.
- ✓ Teaching TPM to be continued 1 year after TQM in remote (Telework with TV Conference). Visiting factory to be twice appropriately.

After the meeting with me, a notice was announced. And, the notice was that:

- ✓ All department participation to QC Circle group expansion. Initially it was limited to just production **Gemba**. And at this time the groups were involved not only the production **Gemba** but also the administrative departments (of course the maintenance department).

Involving administrative department had the meaning and will of expansion of its activity to these departments.

- ✓ The theme to be related to PM for the time being.

This decision puzzled the people of back office. But they understood it is as the training and experience of QC Circle. But they were required to work as the group with the **Gemba** people.

I suggested that managers also attend to this QC Circle tactics as the leaders and silent advisers. The meaning of "silent advisor" is very important role which don't cut in with his/her remarks, but watching and making necessary suggestion.

And I advised to the managers some directions as next 7:

- a) To think things simply.
- b) To know the specialty of each member.
- c) Not to seek completeness.
- d) Not to blame failures & mistakes, but make use it for employee growth.
- e) To be necessary to detach with no advice and tell "work it out again" sometimes.
- f) Not to work hard with them and think from the one rank upper position.
- g) To go to the actual Gemba.

And told the managers that the success of the group activity and raise them is the chance of your growth as a manager.

A little away from the theme of "Oil control", but I introduce some Circles for your reference.

To implement TPM (Total Preventive Maintenance) there are 3 essential factors which are management & control part, all people's participation part and skill part.

#### 1. Machinery management. Which are:

- a) Control machinery conditions with Figures and Indices (KPIs);
- b) Control Regular inspection & maintenance (daily, weekly and monthly inspection Deterioration diagnosis & overhaul);
- c) Education & Training control;

- d) Standardization;
- e) Safety, Environment management.
- 2. The Autonomous Maintenance. And;**
  - a) Machinery 5Ss;
  - b) Understanding troubles (Trouble occurred & Potential trouble Map);
  - c) Use of checklists;
  - d) Correct setup;
  - e) Correct oiling;
  - f) Maintain minor trouble.
- 3. Skill training, and;**
  - a) Understanding instruction manual;
  - b) Skill training & evaluation and control for technicians;
  - c) Skill training & evaluation and control for operators (minor troubles).

And, the QC groups challenged to improve above items excluding skill training issues.

By the way as you know there are the QC 7 tools: Graph, Pareto chart, Fish-Bone diagram, Check list, Histogram, Stratification and Scatter plot diagram.

I add QCPD (QC Process Diagram) to above as essential 7 QC tools, and advocate 8 essential QC tools.



### New QC-7 Tools

In Lean-6-sigma, it advocates the use of New QC 7 tools. Thus, new QC 7 tools are: Affinity Diagram, Interrelationship Diagram, Tree Diagram, Matrix Diagram; Prioritization Matrix, Process Decision Program Chart (PDPC) and Activity Network Diagram (AND).

But I don't use these for manufacturing industry. In the first place, New QC 7 Tools were not advocated for manufacturing industry, but for others industries below.

As you know since the teaching of Deming who were a statistician and a student of W. A. Shewhart, in Japan, Statistic Quality Control is vigorous. This QC 7 Tools is very useful for manufacturing industry which uses numerical analysis such as defect analysis and data analysis.

But on the other hand, it is difficult to use by other industries and works such sales, planning design, restaurant industry, retail, hotel, tourism industry, etc. and general affairs department, accounting department.

Again, these industries and works are difficult to use numerical analysis. Because there is a lot of "language data (linguistic information)". However, it is required the quality improvement for seeking the customer satisfaction. Therefore, a method to find out the direction of the problem by linguistic information and text information was required and "New QC 7 Tools" was born.

Organize various linguistic information and bring out problems. Therefore, it is good to use for other than manufacturing industry. And, everyone in the organization works together to guide them in the right direction.

"New QC 7 Tools" can sort out intricately intertwined problems and it narrows down the problem and makes it easier to plan. You can organize, visualize, and visualize linguistic data.

However, and but, it is quite difficult to actually use it because it is linguistic information including to think and gathering. For instance, you know 5Whys, Fish-Bone Diagram. But I haven't seen good example of them.

Why, Why, ...and getting stuck or bias. And always cannot to reach to possible & potential causes. Then same trouble occurred frequently.

I always teach best and easiest way. Then for the success to get effective analysis, I combine with KJ method. (Brainstorming is OK but not sufficient.)

Again, about New QC-7 Tools: If you can do it, try it. I wish your success, but don't expect it.

(After this TPM, I will write TQM and expect deep discussion with you.)

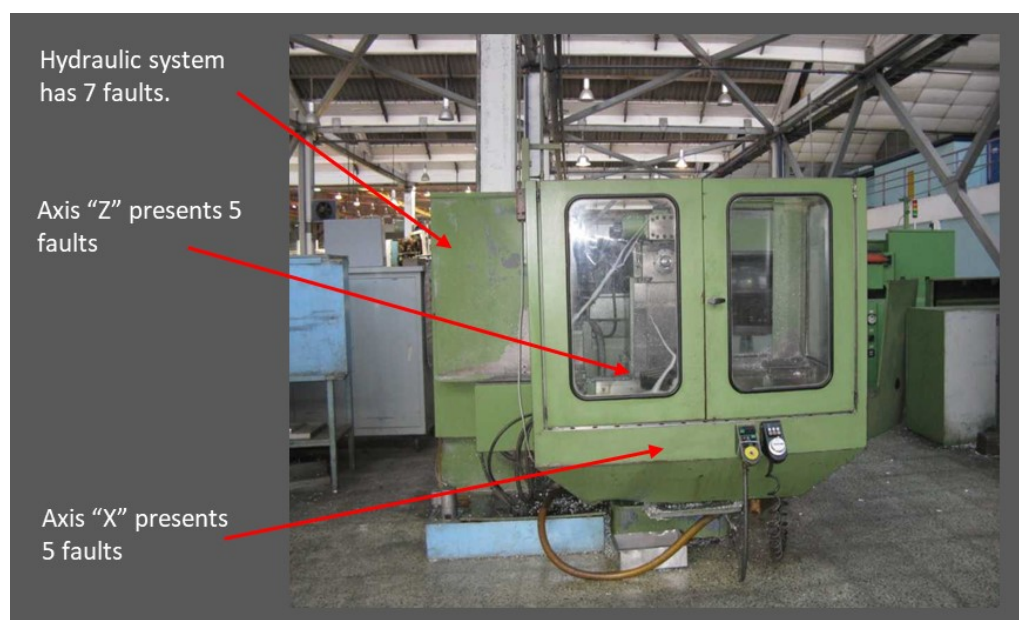
Going back to the QC-Circle of this company.

I accepted to use QC Circle groups establishment for acceleration of PM base establishment. But I need to say that these group activities are not the QC Circle activities, but just group activities. Because these groups were not targeted to improve quality issues. But I accepted to allow this situation. I needed to complete the teaching TQM and they needed to establish the base of PM (Preventive maintenance) very urgently. Their excuse was that the establishment of PM base affects to improve quality and to reach to TQM essence (It is quite true).

Then, I accept these group activities which borrowed the name of QC Circle activities with next conditions. To resolve the problems:

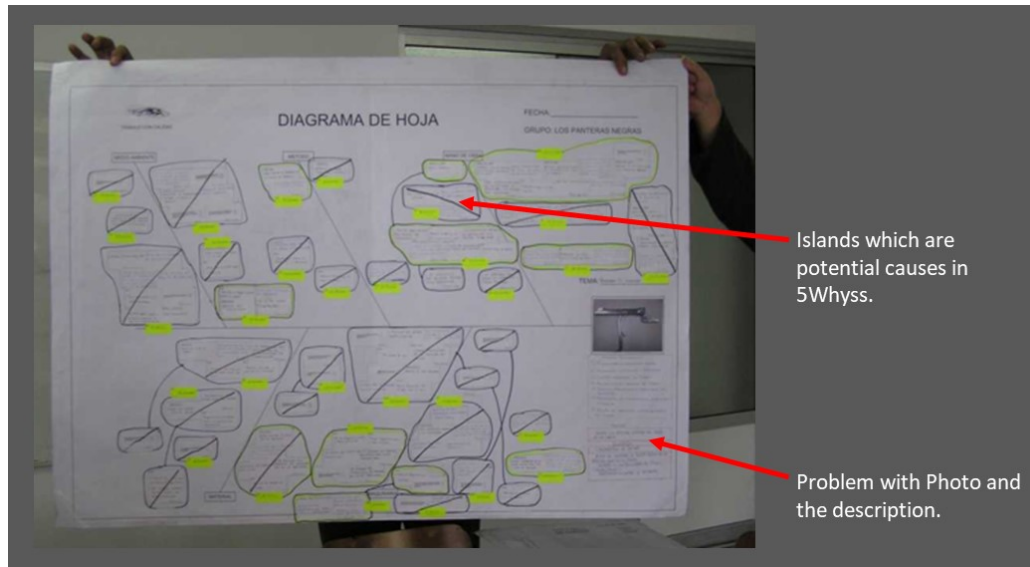
- ✓ Scientific approach to confirm true causes (assumption & potential causes)
- ✓ More than 1 of the QC-7 Tools to be used.

The next picture was just image which was made by a **Gemba** workers of a company and presents a Machine Problem Map (based on the Problem Record by Maintenance Room).



The groups visualized the machine troubles of main machine with using picture to share the information and understanding troubles. This Machine Problem Map also was shared by all groups.

One of QC 7 Tools were shared by all groups. The tool was the **Fish-Bone Diagram** with **5Whys**. And all groups fulfilled the minimum promise (It was a little sly, but accepted). And the image is:



Then one group focused on the problem of operator's work which self-checking of their machines and challenged to make machinery checklists and standardization.

(Below examples are images from my teaching, but not actual.)

Example of machine checklist-1:

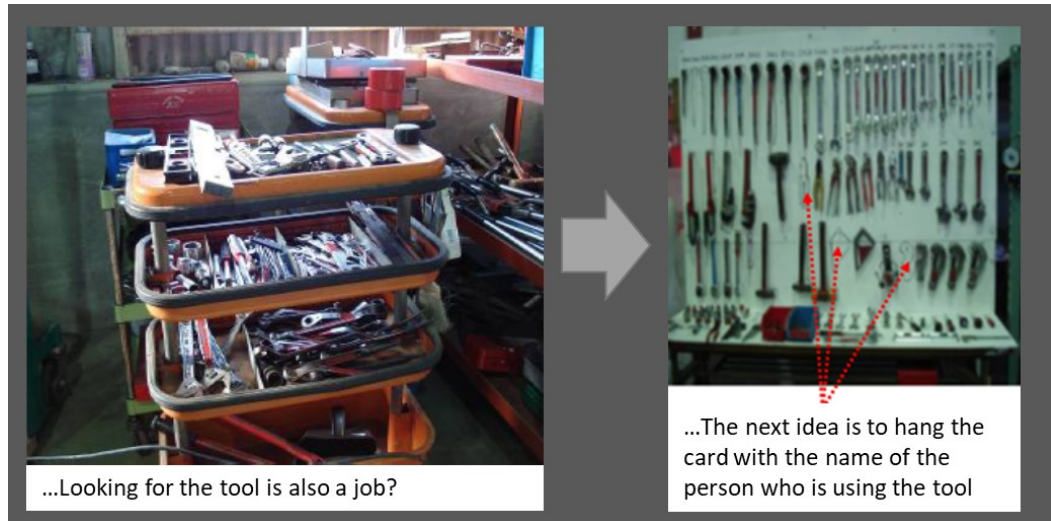
Dust Collector Checklist		Month:		jul-21							Line		HA-30			Author: K. Kimura	
Period	Check-up Article	1	2	3	4	5	6	7	...	...	29	30	31	Comments			
A	Good oil level	O	O														
A	Temperature in the visual margins	O	O														
B	No noise	O	?														
A	Good apparent absorption power	O	O														
B	Security covers in position	O	O														
B	Unworn ties	A	?														
A	Powder does not scatter	O	O														
Signature of the line manager:																	
		Memorable events:												Supervisor signature:			
Period:	A: Daily, before working.													Line Manager signature:			
	B: Monthly.																
Mark:	O: Normal																
	?: Inspection requirement.																
	X: Abnormal																

Machine checklist														
Machine name:	HB-22-3			Month:		jul-21		Section/Line:			HB-2			
Checklist article	Period	1	2	3	4	5	6	7	...	...	29	30	31	Annotations:
The pulley nut is not loose.	A	O	O	O	O	O	O	O						
the switch works fine.	A	O	O	O	O	O	O	X						
the power limiter works.	A	O	▲	O	O	O	O	O						
clean lubricating oil.	D	O	O	X	O	O	O	O						
cargo belt has no damage.	E	O												
condition indicator works fine.	D	X						▲						
Machine is not shaking.	A	O	O	O	O	O	O	O						
Operator Signature:	C	R	R	R	R	R	R	R						
Line Manager Signature:	D	R						R						
Section Manager Signature:	E			A										
Inspection Period:		Mark:							Annotations & date:					
Daily at work starting up	A	No problem							O	05/jul: Malfunction and change of limiter.				
Daily at he end of working	B	Maintenance/Re-Inspection							▲	06/jul: Shaking checking and fixing.				
Daily	C	Reparation/Improvement							X					
Weekly	D													
Monthly	E													


This group used 2 QC-7 Tools. Checklist is one of the 7 Tools.

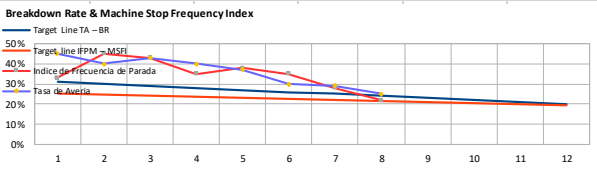
One group was challenged the key part of maintenance and challenged.

**1. 5Ss activity of "Maintenance room". Including Tools-5Ss as below:**



**2. Compile the Machinery (Medical) Record of each machines. With next table:**

 <b>MACHINE LEDGER</b>									
Number:		Purchasing Date: / /							
Mach. Name:									
Overhaul History		O-No-2	O-No-3	O-No-4					
Date: / /		/ /	/ /	/ /					
Six-Monthly Inspection		I-No-2	I-No-3	I-No-4	I-No-5	I-No-6	I-No-7	I-No-8	I-No-9
Scheduled Date: / /		/ /	/ /	/ /	/ /	/ /	/ /	/ /	/ /
Real Date: / /		/ /	/ /	/ /	/ /	/ /	/ /	/ /	/ /
Date & Number	Phenomena Detected	Breakdown Time	Breakdown or Problem Detected	Repairing Annotation	Technician	Repairing time			
						Since	To		



The graph shows four data series over 12 periods: Target Line TA-BR (blue), Target Line #PM-MSM (red), Índice de Frecuencia de Parada (green), and Tasa de Avería (yellow). All series show a general downward trend, starting between 30% and 40% and ending near 20%.

### 3. Provide Maintenance 7 tools. Which are:

- a) List of Standard Equipment.

It is also a little sly, but was accepted.

In maintenance room there are many tools. And this group made an inventory taking of tools and equipment.

Then they made the Standard Equipment Lists. And additional preparations were next 6 items.

- b) Washer with oil Bathtub.
- c) Ultrasound Washer (Precise part).
- d) Shadow Graph Meter. (To measure dimension, shape with the shadow.)
- e) Standard Stone Table (Marble) (It is useful to check torsion of pieces, tiny deformation).
- f) Lighting.
- g) Measurement equipment: Micrometer, Caliper, Meter Gauge, Weight Gauge, Limit Gauge.

A group which was organized with the members of Human resources, Production Engineer, Maintenance Technician, Operator and IT Engineer. It was very unique and very good diversity and they were very effective.

Their target was to establish the proper Education & Training ① Manual, ② Actual training and feed back (to manual and skill evaluation), ③ Skill evaluation form and, ④ Necessary equipment.



**The training items they picked up and standardized were:**

**For operators:**

1. Setting-up;



2. Change of Parts and Spare Parts;
3. **Daily Check List;**
4. Machine structure.
5. Breakdown and Correspondence;
6. Black Box. (Zone of the machine to which only the manufacturer has access;
7. **Cleaning and 5Ss;**
8. Electricity, Air, Oil;
9. **Special tool;**
10. Measurement and Record.

And the training items for maintenance technicians were:

#### For maintenance technicians:

1. Change of parts;
2. Machine Structure;
3. Review and work order;
4. 6 months inspection: inspection item and work order;

#### Evaluation method:

5. Breakdown Analysis and PARETO;
6. Failure and Cause and Measures;
7. Failure Rate and KPIs;

#### Trend and measurements:

8. QC Process Diagram (CCPD);
9. 7 QC Tool;
10. Product Quality and Maintenance;
11. Equipment efficiency;
12. Standard machine accessories;
13. Parts control. (Stock of imported parts).



### Transferring responsibility to operator.

Then, a conflict occurs. When this group processing its theme there was a conflict in the Maintenance department. It was a change of operator's duty (job range) and the education items. It was the participation of operator to the maintenance job. The above list.

The conflict was "***Change of Parts and Spare Parts***".

Before my joining to this company, the job of "Set-up, Change of Parts and Spare Parts" are the job of maintenance technician. Yes, even "***Set-up***" which are the jobs of change materials and die tools was the job of maintenance department. The operator's job was just monitoring & inspection work, product removal and On & Off of start switch. Therefore, it was quite natural that operator didn't & couldn't have the quality mind to his work. And, the mind which Operator to be the person who breaking down machine and maintenance person who to be maintain it. Of course, it was never good for quality mind and quality responsibility. Then, I suggested the change of job range which is to transfer the Setup job from technicians to machine operator as the first.

At this time, there was very heavy conflict with involving the Union. The technicians were lost the status of maintenance department and it was related to their salary. And they were involved in the machine operator. This improvement was welcomed by operators from the point of view the work weight. But

There was furious opposition by the side of technicians. However, and anyway, these Set-up jobs was transferred to the operator's job. And again, the operator's job range was suggested to expand. The maintenance for small machine trouble also was suggested to transfer to operator.

The main point of this conflict was the salary up, because of the increase of work, responsibility and requirement of additional knowledge. But, after the discussion, this requirement wasn't accepted.

Basically, this requirement was no fairness. Because of increase of work volume? ...It doesn't increase under the regular working 8 hours and overtime work with overtime fee. Responsibility? ...It is quite fair to require the quality in his work. And even, if occurred a quality trouble, it is never affected to salary & welfare of the operator.

Knowledge increase? ...It is a human's natural requirement.

Anyway, this group's activity had big fuss and didn't advance sufficiently. And, the achievement of this group was

- 1) Necessary Education & Training items list up. And
- 2) Negotiation of "Changing Parts and Spare Parts".
- 3) Set-up retraining.

And, other necessary education items were taken over by the organization (HR and Maintenance Department by joint).

I stop the introduction of the group activity of a manufacturing company here, because of no limit. And I will introduce their activity in somewhere and go back to the main theme Oil Control.

## The task of operator

Actually, I feel a concern about the possibility of operator involvement. I always write the importance of "All people participation" and in the TPM-10<sup>12</sup>, I wrote the theme of "Employee Engagement". And, in somewhere, I wrote my failure which was a case of introduction of **Kanban** system in a company.

Again, it is very easy to teach and introduce **Kanban** system or other techniques. (In this case, it was the introduction of it in the model line). But soon the **Kanban** system introduced was collapsed, because of the immature corporate constitution. In retrospect, my consultancy job spends most of the time for establishing such essential background. If not, it is not possible to expect the sustainability of systems introduced.

How to establish the sense of "**All people's participation**". I introduced the essential elements for this. (see Employee Engagement, Visual Control, etc.). It is the function of Time, Passion and Effort to stabilize it as the corporate constitution. Therefore, please re-read these references once again.

<sup>12</sup> TPM-10: <https://archive.org/details/tpm10employeeengagementoilcontrol> & <https://archive.org/details/tpm10elcompromisodeltrabajadoryelcontroldelalubricacion>



Now *"The task of operator"* (Some parts to be duplicated).

Operator needs to understand why lubrication is important and purpose of oiling. **And, the purpose of oiling is:**

- 1) Prevention of avoidable deterioration (Tribology).
- 2) Remove the friction temperature.
- 3) Water rust prevention.
- 4) Remove trash with oil flow.
- 5) Extension of the part life can be prolonged.
- 6) Machine smooth movement.

**And, the actual lubricating work is:**

- 1) Oil depending on the case.
- 2) Clean lubricating oil.
- 3) Lubricate from the correct mouth.
- 4) Standardized time.
- 5) Standardized quantity.
- 6) Oiling to the friction surface certainly.

When making the lecture to operator, I give a shock to the operators sometimes in some photos. The purpose is to share the sense of misery of machine lifetime. And, the title is "Machine graveyard". I introduce the photos below.



## MACHINE CORPSE

This is the main machine tool of a company. But, to be forsaken, Abandoned and Taken out the parts to use these to other machines. It is very pathetic scene.



Machine corpse  
This is the main machine tool of a company.  
But  
To be forsaken,  
Abandoned and Taken  
out the parts to use these  
to other machines.  
It is very pathetic scene.



## MACHINE GRAVEYARD

A scene of tears overflow... It may not possible to teach operators proper maintenance, if there is such graveyard.



Machine graveyard  
(A scene of tears  
overflow)  
It may not possible to  
teach operators proper  
maintenance, if there is  
such graveyard.

- 1) Maintain cleanliness of the friction point and friction surface of machinery & equipment.
- 2) Maintain and clean the oil container & equipment.
- 3) Specifically close the cap or lid of the container.
- 4) Be careful not to get garbage, water, etc. in the container.
- 5) Show & maintain the card that indicates oil kinds and cycle. Lubricant Oil treatments points.
- 6) Be aware of not to put dust, garbage, water in oil.
- 7) Not to mistake the kinds of oil.
- 8) Attention to safety.

And, what matters is using your machine with the correct method. And, the oil control also the work of operator. Thus, as I wrote above, the task of operator is never difficult. But actually, it is not implemented it sufficiently.

When looking the trend of the companies, there is 3-layer structure:

- ✓ **Small such domestic industry:** Love their machines and maintain by themselves in their knowledge (sometimes mistake way)
- ✓ **Medium & large manufacturing company:** Having maintenance system, but insufficient *Jishu-Hozen* (insufficient "All people's participation").
- ✓ **Large company:** Not only the system but also well involvement of all people.

When looking worldwide most is the second one (in population and number of companies).

The base of TPM is anyway *Jishu-Hozen*. And the task of management is to establish and maintain the sharing sense of value with all employees with providing "*Employees Engagement*".

## V. Next Lecture

This time, I postpone the column of “Teaching Company” and, Continuation with Cost Reduction, Oil control-4 and Teaching Company.

**Koichi Kimura CC4 – May-2021.**

**Factory Management Institute**